

## REMARKS

Claims 1-3, 5-15 and 32-35 are now presented for examination. Claims 1, 6 and 32 have been amended to define still more clearly what Applicants regard as their invention, in terms which distinguish over the art of record. Claims 33-35 have been added to assure Applicants of the full measure of protection to which they deem themselves entitled. Claims 1, 6 and 32 are the only independent claims.

Claims 1-3, 6-10, 15 and 32 have been rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,263,250 (Nishiwaki et al.). Claims 5 and 11 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Nishiwaki et al. Claims 12 and 13 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Nishiwaki et al. in view of Japanese Patent Publication No. JP 2-187346 (*JP '346*). Claim 14 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Nishiwaki et al. in view of U.S. Patent No. 5,548,894 (*Muto*). With regard to the claims as currently amended, these rejections are respectfully traversed.

Independent Claim 1 as currently amended is directed to a method of processing an ink discharge port of an ink jet head provided with one or more discharge ports for discharging ink. The discharge ports are provided at respective discharge port positions on a discharge port plate. According to the method, a mask plate having one or more openings corresponding to the discharge ports are closely contacted with the face of the discharge port plate on the ink discharge side. The discharge port on the discharge port plate is formed in a tapered shape that decreases in area in the discharge direction of the discharge port by irradiating plural high energy ultraviolet beams simultaneously through the mask plate so that the beams are inclined with

respect to the vertical axis perpendicular to the mask plate. Each of the plural beams is irradiated at one of the respective discharge port positions of the discharge port plate and is incident at the single discharge port position from a different direction, the plural beams are inclined at inclination angles that determine the tapered shape.

Independent Claim 6 is directed to a method of manufacturing an ink jet head provided with one or more discharge ports for discharging ink and a discharge port plate that has the discharge port plates at respective discharge port positions. According to the method, the discharge port on the discharge port plate of is formed in a tapered shape that decreases in area in the discharge direction of the discharge port by irradiating plural high energy ultraviolet beams simultaneously through the mask plate so that the beams are inclined with respect to the vertical axis perpendicular to the mask plate. Each of the plural beams is irradiated at one of the respective discharge port positions of the discharge port plate and is incident at the single discharge port position from a different direction, the plural beams are inclined at inclination angles that determine the tapered shape.

Independent Claim 32 as currently amended is directed to a method of processing an ink discharge port of an ink jet head providing with one or more discharge ports for discharging ink. The discharge ports are provided at respective discharge positions on a discharge port plate. According to the method, a mask plate having one or more openings corresponding to the one or more discharge ports is closely contacted with the face of the discharge port plate on the ink discharge side. The discharge port on the discharge port plate is formed in a tapered shape that decreases in area in a discharge direction of the discharge port by irradiating plural high energy beams simultaneously through the mask plate so that the beams are inclined with respect to a

vertical axis that is perpendicular to the mask plate. The plural beams are simultaneously irradiated at a single discharge port position of the discharge port plate to form the discharge port and are incident at the single discharge port from different directions at inclination angles that determine the tapered shape.

In Applicants' view, Nishiwaki et al. discloses a method of manufacturing a nozzle plate for an ink jet printer in which plural elongated beams are generated by dividing a laser beam. The plural beams are respectively applied to corresponding lens elements of a flyeye lens array. The structure is arranged in such a manner that the diameter of the plurality of the beams in the shorter direction is made smaller than that of each of the lens elements, so that the plural beams are further divided into plural elongated secondary beams by the flyeye lens. The plural secondary beams are bundled on a diaphragm in such a manner that their lengthwise directions substantially coincide with each other so that a beam pattern is formed. A row of openings arranged in the lengthwise direction of the beam pattern and formed in the diaphragm member are uniformly and efficiently irradiated with the thus-formed beam pattern. Then, the image of the row of openings is projected onto a plastic plate or the like so that a multiplicity of holes are formed in the plate. As a result, a nozzle plate of an ink jet printer head can be accurately and quickly manufactured.

According to the invention defined in Claims 1, 6 and 32, a discharge port on the discharge port plate is formed of a tapered shape that decreases in area in the discharge direction of the discharge port by irradiating plural high energy beams simultaneously through a mask plate so that the beams are inclined with respect to the vertical axis perpendicular to the mask plate. The plural beams are simultaneously irradiated at a single discharge port position to form

the discharge port and are incident at the single discharge port position from different directions at inclination angles that determine the tapered shape.

Nishiwaki et al. may teach manufacture of a nozzle plate for an ink jet printer in which a laser beam is divided to provide plural linear beams each having a width smaller than a corresponding lens element. The plural linear beams are applied to lens elements to generate plural secondary beams which are superposed on a diaphragm member so that they coincide to form a linear beam pattern on the diaphragm member with the lengthwise direction of the pattern disposed in the direction in which openings are arranged in the diaphragm member. The image of the openings illuminated by the beam pattern are projected onto the nozzle plate surface to form nozzle holes for ink jet printing. As a result, Nishiwaki et al. only teaches forming an elongated hole or a configuration of small circular holes.

The Nishiwaki et al. disclosure, however, is devoid of any teaching as to the shape of the nozzles in the discharge direction and fails in any manner to teach or suggest formation of a tapered shape discharge port as in Claims 1, 6 and 32. Accordingly, it is not seen that Nishiwaki et al. in any manner teaches or suggests the feature of Claims 1, 6 and 32 of forming a discharge port on a discharge port plate of a tapered shape that decreases in area in the discharge direction of the discharge port by irradiating plural high energy beams simultaneously through a mask plate so that the beams are inclined with respect to the vertical axis perpendicular to the mask plate combined with the feature of the plural beams being simultaneously irradiated at a single discharge port position to form the discharge port and being incident at the single discharge port position from different directions at inclination angles that determine the tapered shape.

New Claims 33-35 depending from Claims 32, 1 and 6 respectively include the feature of the ink discharge side of the discharge port having a different shape than the ink supply side of the discharge port. This feature is disclosed at least at lines 8-15 of page 23 of the specification as originally filed with respect to Fig. 8 of the drawings. No new matter is believed to have been added.

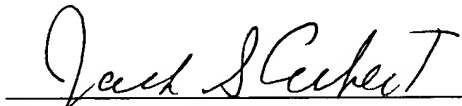
A review of the other art of record has failed to reveal anything which, in Applicants' opinion, would remedy the deficiencies of the art discussed above, as references against the independent claims herein. Those claims are therefore believed patentable over the art of record.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual consideration or reconsideration, as the case may be, of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable consideration and reconsideration and early passage to issue of the present application.

Applicants' attorney, Douglas W. Pinsky, may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

  
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